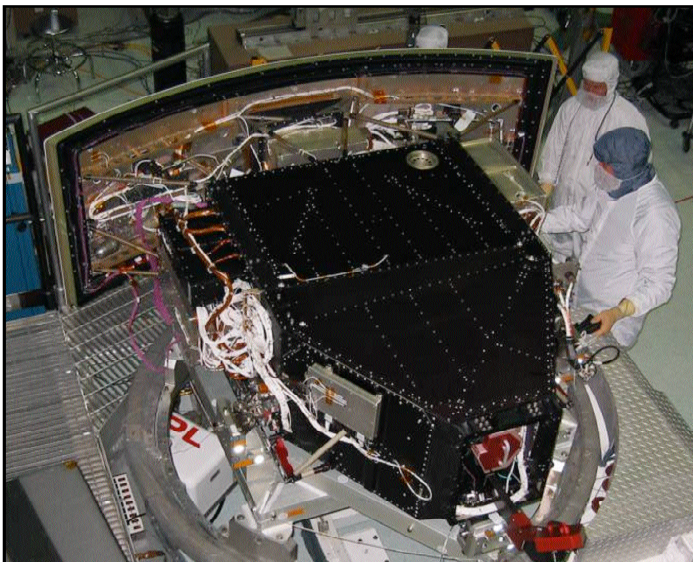


The Hubble Space Telescope (HST) Wide Field Camera 3 (WFC3) Instrument

Overview

Wide Field Camera 3 (WFC3) is an HST facility instrument designed to replace the extraordinarily successful but aging WFPC2 and thereby ensure and enhance the imaging capability of HST in the last years of its observing lifetime. WFC3 is currently being prepared for installation in HST Servicing Mission 4 (SM4). On October 31, 2006, NASA Administrator Michael Griffin announced the formal authorization of SM4, after NASA had conducted a thorough analysis to evaluate the safety of carrying out such a mission. As of this writing (December 2006), the SM4 flight is tentatively targeted for launch during the spring to fall of 2008.

The WFC3 is configured as a two channel instrument. The incoming beam from HST is directed into the instrument using a pickoff mirror. Within the instrument, the beam is directed to either the UV/Visible (UVIS) channel, covering 200-1000 nm wavelengths with a sensitive CCD camera, or the IR channel, covering 800-1700 nm with a novel HgCdTe array.



WFC3 in integration and test at GSFC. In this photo, the instrument is fully integrated (all optics, filters, detectors, electronics, and mechanisms in place) for an early thermal-vacuum test. This test, carried out in late 2004, exercised both the UVIS and IR channels of the instrument end-to-end, with very good results.

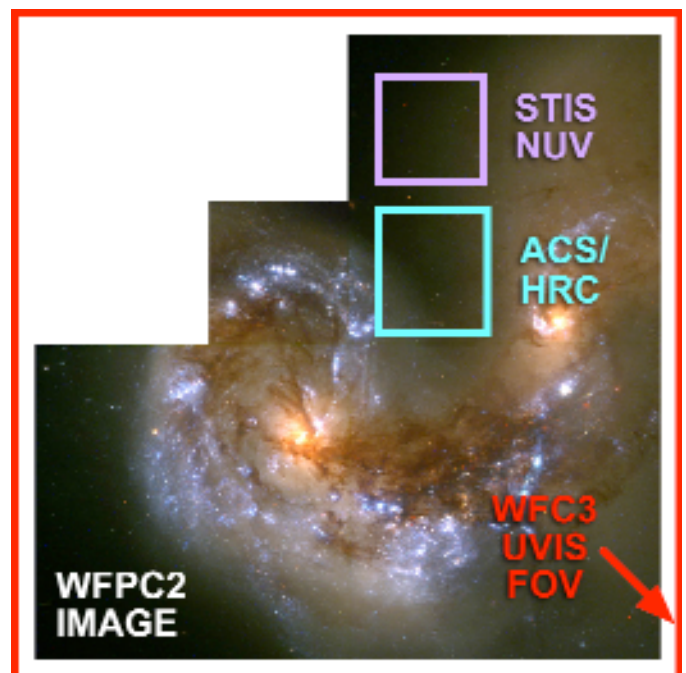
Scientific Goals

The principal theme for WFC3 is the ability to perform wide-field imaging with a broad wavelength coverage. WFC3's UVIS channel extends large-format imaging at HST's sharp angular resolution to the near-UV, while the sensitive wide-field IR channel will explore the IR universe that has been revealed by NICMOS deep field observations.

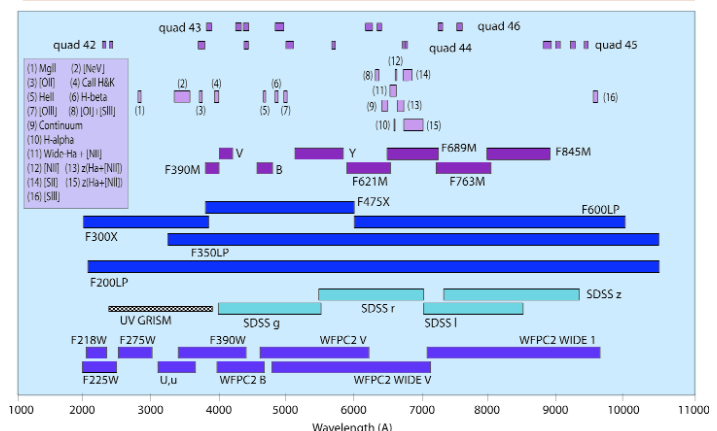
WFC3 provides a panchromatic view of the universe from the near-UV at 200 nm to the near-IR at 1700 nm. It will enable the study of the controlling mechanisms of star formation in galaxies and the probing of dusty star-forming regions. Its near-IR

capability will be vital for observations of Type Ia supernovae "standard candles" for continuing HST's investigation of the mysterious "dark energy" that appears to be accelerating the expansion of the universe. WFC3's wide field of view and near-IR sensitivity will be extremely powerful for finding and studying high redshift galaxies. Near-IR observations of these remote objects are actually seeing them in the rest frame UV. WFC3's UVIS channel will provide invaluable observations of nearby galaxies in the near-UV for comparative study.

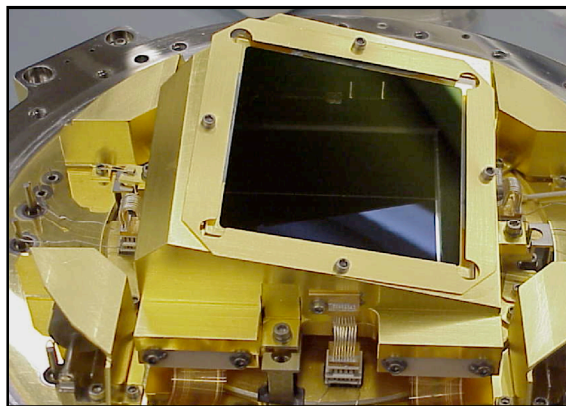
UVIS Channel



The red square depicts the 160 x 160 arcsec field of view of WFC3's UVIS channel, to scale with the fields of WFPC2 and the current NUV imagers on HST. WFC3 provides a factor of ~35 increase in sky coverage vs. HST's current sensitive NUV imagers.

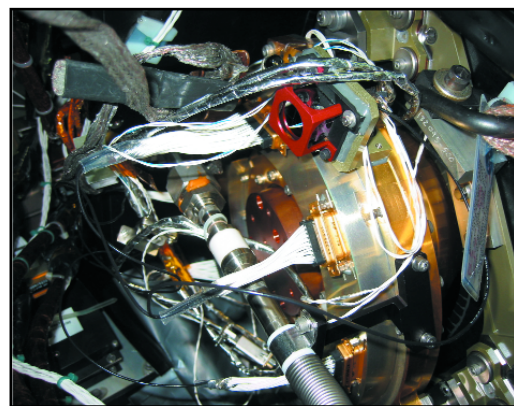


WFC3 offers a rich set of broadband UVIS filters for deep observations, as well as narrowband filters for studying key astrophysical emission lines, and a UV grism for full-field, low-resolution spectroscopy.

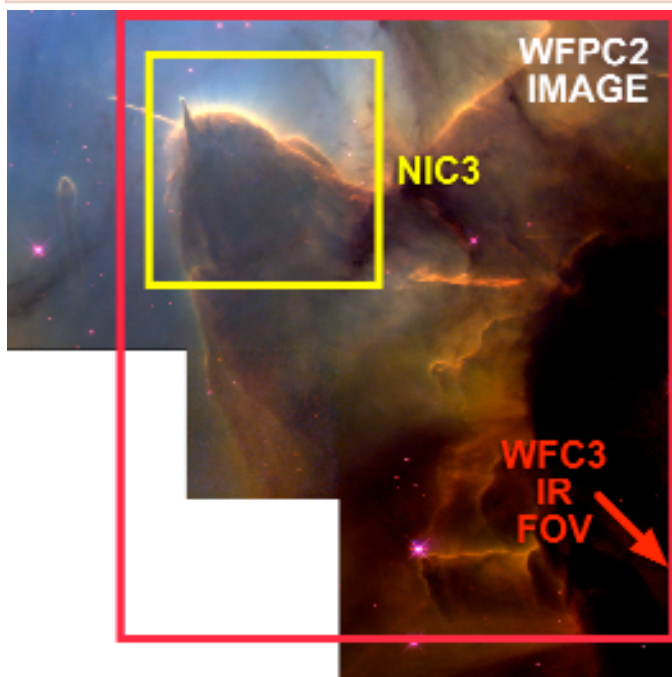


(Left) Closeup of UVIS detector package, incorporating two superb 2K x 4K CCDs developed by Marconi Applied Technologies (now e2v). The CCDs offer enhanced quantum efficiency in the near-UV, along with 3 e- rms read noise from all four readout amplifiers.

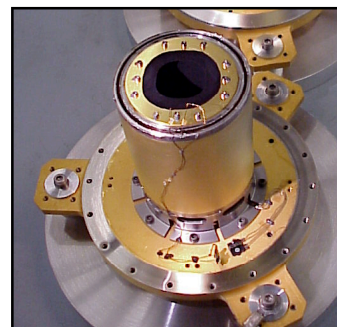
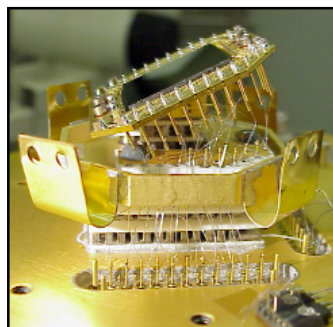
(Right) The UVIS detector package installed on the WFC3 optical bench.



IR Channel



The red square here depicts the 123 x 136 arcsec field of view of WFC3's IR channel, to scale with the fields of WFPC2 and the largest NICMOS camera. WFC3 provides a factor of 7 increase in field vs. the NIC3 camera, and a factor of >10 increase in J+H band survey efficiency, with finer angular resolution, photometric accuracy, and stability.



The left image above shows the 1K x 1K HgCdTe focal plane array at the heart of the WFC3 IR channel. This custom device was developed by Rockwell Science Company (now Teledyne Imaging Sensors) with a 1.7 micron cutoff wavelength, permitting low-dark-current operation at a temperature of 145-150 K, achievable with thermoelectric cooling alone, i.e. without expendable cryogenics or mechanical coolers. A cooled inner shield (right hand image) helps to minimize the thermal radiation background incident on the detector, yielding zodiacal-background-limited sensitivity in broadband imaging.

Status and Plans

Thermal-vacuum testing of WFC3 carried out in late 2004 was executed during a period in which the shuttle-based SM4 had been cancelled on the grounds of shuttle safety. Hence, the instrument had been integrated in a preliminary manner for a performance demonstration, but with the resolution of some technical issues deferred; nevertheless the end-to-end performance of the instrument was extremely good overall. Now that the program is back to a "prepare for flight" status, the WFC3 team is systematically working through the technical liens to bring the instrument to a fully flight-qualified and calibrated status. The most exciting change in anticipated scientific performance results from the plan to incorporate a new-generation IR detector; the substrate-removed HgCdTe arrays now available from Teledyne offer markedly improved quantum efficiency and sensitivity for the WFC3 IR channel. The re-integration, qualification, and calibration of WFC3 will be completed in 2007, for delivery to the HST Project in support of the tentative SM4 launch date of spring to fall of 2008.

Scientific Oversight Committee

The WFC3 Scientific Oversight Committee (SOC) is chartered to provide scientific advice to the WFC3 project. Its members are:

Bruce Balick	Howard E. Bond	Daniela Calzetti
C. Marcella Carollo	Michael J. Disney	Michael A. Dopita
Jay A. Frogel	Donald N. B. Hall	Jon A. Holtzman
Gerard Luppino	Patrick J. McCarthy	Francesco Paresce
Abhijit Saha	Joseph I. Silk	John T. Trauger
Alistair R. Walker	Brad C. Whitmore	Rogier A. Windhorst
Erick T. Young	Robert W. O'Connell, (Chair)	
Randy Kimble (Ex Officio, WFC3 Instrument Scientist)		
John MacKenty (Ex Officio, WFC3 Deputy Instrument Scientist)		

The IR channel also offers a diverse complement of broadband filters, narrowband filters, and grisms.

For more information, please visit WFC3 site at <http://wfc3.gsfc.nasa.gov> or <http://www.stsci.edu/hst/wfc3>

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